

35
amended
S14B1

35. (New) The method according to claim 12, wherein said determination step determines the fundamental pulse width on the basis of a plurality of driving conditions according to the condition of the printhead.

REMARKS

Favorable consideration and allowance of the subject application are respectfully solicited.

Claims 1-35 are now pending in the application, with Claims 1, 12 and 23 being independent. Claims 1-5, 12-16, 23, 25 and 30 have been amended and Claims 34 and 35 have been added herein.

In the Office Action dated February 15, 2002, the claims were rejected under 35 U.S.C. §§ 102 and 103 in view of U.S. Patent No. 5,497,174 (Stephany et al.) and several other citations. The amendments herein are believed to even further distinguish the claimed invention from the applied citations.

Independent Claim 1 is directed to a printing apparatus for performing printing by using a printhead having a plurality of printing elements. Independent Claim 12 is directed to a method of controlling such a printing apparatus and independent Claim 23 is directed to a computer-readable memory storing program codes of control of such a printing apparatus. Each independent claim recites means for, steps of or program codes of counting the number of simultaneously driven printing elements of a plurality of printing elements when printing data is printed, determining a fundamental pulse width on the basis of a driving condition according to a condition of the printhead, and controlling a driving

pulse to be applied to printing elements used in the printing of the printing data. The driving pulse is a pulse generated by correcting the fundamental pulse width determined based on the counted number of simultaneously driven printing elements.

Stephany et al. describes an ink jet printer which sets a driving pulse width by look-up tables contained in ROM1 46. In the embodiment of Fig. 4, three parameters are input into ROM1 46 to determine the pulse width: a two-bit word representing the number of heater elements to be fired from ROM2 44, the count of counter 46 representing the relative position on the printhead of the heater elements to be fired, and printhead temperature from thermistor 60. Numerous look-up tables, each reflective of a particular combination of printing conditions, can be made available from ROM1 46. These printing conditions include desired spot size, a particular type of ink, and a particular type of copy sheet. Based on the particular addresses selected in ROM1 46, the appropriate duration of the heater pulse can be determined after every cycle of ejection of ink.

However, it cannot be said that in Stephany et al. a fundamental pulse width is determined based on a driving condition and that a driving pulse is generated by correcting that fundamental pulse width based on a counted number of simultaneously driven printing elements. That is, in Stephany et al., a pulse width is selected from ROM1 46 based on all the input criteria including the number of heater elements to be fired. A fundamental pulse width is not intermediately determined based on certain information and then further modified based on further information.

Thus, Stephany et al. fails to disclose or suggest at least determining a fundamental pulse width on the basis of a driving condition according to a condition of a

printhead, and controlling a driving pulse to be applied to printing elements, with the driving pulse being a pulse generated by correcting the determined fundamental pulse width based on a counted number of simultaneously driven printing elements, as is recited in independent Claims 1, 12 and 23.

Thus, Stephany et al. fails to disclose or suggest important features of the present invention recited in the independent claims.

The remaining citations have been reviewed, but are not believed to remedy the deficiencies of Stephany et al. noted above with respect to the independent claims.

Thus, independent Claims 1, 12 and 23 are believed to be in condition for allowance. Dependent Claims 2-11, 13-22 and 24-35 are also believed to be allowable at least for the same reasons as their respective independent claims.

Applicants submit that this application is in condition for allowance, and a Notice of Allowance is respectfully requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,


Attorney for Applicants

Registration No. 33,628

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200
MAW\mt

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

1. (Twice Amended) A printing apparatus for performing printing by using a printhead having a plurality of printing elements, comprising:

[discriminating means for discriminating] counting means for counting the number of simultaneously driven printing elements of said plurality of printing elements when printing data is printed;

determining means for determining a fundamental pulse width on the basis of a driving [conditions] condition according to a condition of the printhead; and

control means for controlling a driving pulse to be applied to printing elements used in the printing of the printing data, [on the basis of the fundamental pulse width determined by said determining means and the number of simultaneously driven printing elements discriminated by said discriminating means] wherein the driving pulse is a pulse generated by correcting the fundamental pulse width determined by said determining means on the basis of the number of simultaneously driven printing elements counted by said counting means.

2. (Amended) The apparatus according to claim 1, wherein the driving [conditions include] condition includes at least one of a wiring resistance, heater resistance, driving TrON resistance, and environmental temperature of said printhead.

3. (Twice Amended) The apparatus according to claim 1, further comprising:

storage means for storing a first management table for managing the correspondence of the driving [conditions] condition with the fundamental pulse width, and a second management table for managing the correspondence of the fundamental pulse width with a change amount of the fundamental pulse width based on the number of simultaneously driven printing elements; and

second determining means for determining a change amount of the fundamental pulse width, which corresponds to the number of simultaneously driven printing elements, by using the second management table,

wherein said first determining means determines the fundamental pulse width using the first management table, and

said control means changes the fundamental pulse width determined by said first determining means by the change amount determined by said second determining means to generate a driving pulse to be applied to printing elements used in the printing of the printing data.

4. (Twice Amended) The apparatus according to claim 1, wherein said control means defines the fundamental pulse width by either one of leading and trailing edges of a pulse signal on the basis of the driving [conditions] condition, and controls a driving pulse width of a driving pulse to be applied to printing elements by the other of the

leading and trailing edges of the pulse signal, on the basis of the number of simultaneously driven printing elements.

5. (Twice Amended) The apparatus according to claim 4, further comprising storage means for storing a first management table for managing the correspondence of the driving [conditions] condition with the fundamental pulse width, a second management table for managing the correspondence of the fundamental pulse width with a change amount of the fundamental pulse width based on the number of simultaneously driven printing elements, and a third management table for managing the correspondence of rise time and fall time of the pulse signal, the driving [conditions] condition, and the fundamental pulse width, and

said control means controls a pulse width of the driving pulse corresponding to the number of simultaneously driven printing elements and the driving conditions by using the third management table.

12. (Twice Amended) A method of controlling a printing apparatus for performing printing by using a printhead having a plurality of printing elements, comprising:

a [discrimination step of discriminating] counting step of counting the number of simultaneously driven printing elements of said plurality of printing elements when printing data is printed;

a determination step of determining a fundamental pulse width on the basis of a driving [conditions] condition according to a condition of the printhead; and

a control step of controlling a driving pulse to be applied to printing elements used in the printing of the printing data, [on the basis of the fundamental pulse width determined in said determination step and the number of simultaneously driven printing elements discriminated in the discrimination step] wherein the driving pulse is a pulse generated by correcting the fundamental pulse width determined in said determination step on the basis of the number of simultaneously driven printing elements counted in said counting step.

13. (Amended) The method according to claim 12, wherein the driving [conditions include] condition includes at least one of a wiring resistance, heater resistance, driving TrON resistance, and environmental temperature of said printhead.

14. (Twice Amended) The method according to claim 12, further comprising:

a storage step of storing a first management table for managing the correspondence of the driving [conditions] condition with the fundamental pulse width, and a second management table for managing the correspondence of the fundamental pulse width with a change amount of the fundamental pulse width based on the number of simultaneously driven printing elements; and

a second determination step of determining a change amount of the fundamental pulse, which corresponds to the number of simultaneously driven printing elements, by using the second management table,

wherein the first determination step determines the fundamental pulse width using the first management table, and

the control step comprises changing the fundamental pulse width determined in the first determination step by the change amount determined in the second determination step to generate a driving pulse to be applied to printing elements used in the printing of the printing data.

15. (Twice Amended) The method according to claim 12, wherein the control step comprises defining the fundamental pulse width by either one of leading and trailing edges of a pulse signal on the basis of the driving [conditions] condition, and controlling a driving pulse width of a driving pulse to be applied to printing elements by the other of the leading and trailing edges at the pulse signal, on the basis of the number of simultaneously driven printing elements.

16. (Twice Amended) The method according to claim 15, further comprising a storage step of storing a first management table for managing the correspondence of the driving [conditions] condition with the fundamental pulse width, a second management table for managing the correspondence of the fundamental pulse width with a change amount of the fundamental pulse width based on the number of

simultaneously driven printing elements, and a third management table for managing the correspondence of rise time and fall time of the pulse signal, the driving [conditions] condition, and the fundamental pulse width, and

said control step comprises controlling a pulse width of the driving pulse corresponding to the number of simultaneously driven printing elements and the driving conditions by using the third management table.

23. (Twice Amended) A computer-readable memory storing program codes of control of a printing apparatus for performing printing by using a printhead having a plurality of printing elements, comprising:

a program code of a [discrimination step of discriminating] counting step of counting the number of simultaneously driven printing elements of said plurality of printing elements when printing data is printed;

a program code of a determination step of determining a fundamental pulse width on the basis of a driving [conditions] condition according to a condition of the printhead; and

a program code of a control step of controlling a driving pulse to be applied to printing elements used in the printing of the printing data, [on the basis of the fundamental pulse width determined in said determination step and the number of simultaneously driven printing elements discriminated in the discrimination step] wherein the driving pulse is a pulse generated by correcting the fundamental pulse width

determined in said determination step on the basis of the number of simultaneously driven printing elements counted in said counting step.

25. (Amended) The apparatus according to claim 1, wherein the driving [conditions are conditions including] condition includes printhead characteristics.

30. (Amended) The method according to claim 12, wherein the driving [conditions are conditions including] condition includes printhead characteristics.

MAW\tnt

DC_MAIN 118473 v 1